THE MUNICIPALITY OF METROPOLITAN TORONTO

SWEAP

SOLID WASTE ENVIRONMENTAL ASSESSMENT PLAN

Component 2: LANDFILL SITE SEARCH

Discussion Paper No: 2.2

Title: LANDFILL SELECTION PROCESS: LANDFILL (REVISED APPROACH)

Date: September 1990

DEPARTMENT OF WORKS
SOLID WASTE MANAGEMENT DIVISION

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SITE SELECTION PROCESS:

LANDFILL (REVISED APPROACH)

DISCUSSION PAPER 2.2

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1414-12
12 September 1990

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1.0 INTRODUCTION

Metropolitan Toronto (Metro) began preparing a Solid Waste Environmental Assessment Plan (SWEAP) in 1987, to develop a comprehensive long-term system to deal with all aspects of its domestic, commercial and non-hazardous industrial solid waste, plus any other wastes for which it is responsible under agreements.

Potential solid waste management systems for Metro have been broadly defined and described in a report to Metro Toronto entitled "Towards a Solid Waste Management Master Plan - A Status Report on Metropolitan Toronto's Planning Process", Discussion Paper 7.1, dated January 1990. The alternative waste management systems identified in Discussion Paper 7.1 have, in addition to waste reduction, included central recycling, composting and landfilling. Two of the alternative systems also included incineration with energy recovery.

A site selection process is required for siting those facilities that will be part of the selected waste management system. This report describes the process which will be used to site a landfill facility. Other reports deal with the site selection process for Energy from Waste Facilities (EFW's), materials recovery facilities (MRF's) and composting facilities*. A further report will be published which will deal with the selection of an overall solid waste management system.

The approach described in this report will result in the identification of the preferred landfill site. If Metro wishes to proceed with more than one landfill facility, the same approach will be used to identify a second, third and subsequent landfill sites.

SWEAP Task Force #1 prepared a paper entitled "Site Criteria Issues to be Addressed by SWEAP" (attached as Appendix A), and presented it to Metro in September 1988. The concepts and issues addressed by Task Force #1 are also considered in this Discussion Paper.

A Glossary has been prepared for a number of terms used in this Paper.

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* These are as follows:

- Discussion Paper 3.5 A: Site Selection Process: Materials Recovery Facility (MRF);
- Discussion Paper 3.5 B: Site Selection Process: Composting;
- Discussion Paper 3.5 C: Site Selection Process: Energy From Waste (EFW).

2.0 PURPOSE, GENERAL PREMISES AND GOAL

2.1 Purpose

At the time of the initiation of SWEAP in 1987, Metro and the Regional Municipalities of York and Durham comprised the study area for the siting of the landfill component of the waste management system. The rationale for including Metro and these Regions was that they generated the waste being managed, were close to the waste sources, had not resolved their long-term disposal needs and were discussing cooperative approaches to manage their wastes. Furthermore, Metro was managing the disposal of a substantial amount of solid waste from these Regions as a result of agreements with them.

Since York and Durham Regions are not now participating with Metro in the SWEAP process and have embarked on their own waste management studies, the rationale previously used to establish the study area of Metro, York and Durham has been reassessed.

It has been determined that a new study area and a revised site selection process should replace the original study area and siting process outlined in Discussion Paper 2.1, "Landfill and Study Area Characterization". The comments received on Discussion Paper 2.1 from the SWEAP Task Forces & Multi-Stakeholders Committee as well as numerous government agencies have been considered in the development of these revisions.

The purpose of this document is to describe and provide a rationale for the new study area and a revised site selection process for the siting of a landfill for Metro.

2.2 General Premises Guiding the Siting of Landfill Facilities for Metro

The following general premises were considered in the development of the revised landfill site selection process:

- Metro is undertaking a solid waste management master planning process to find an appropriate long-term solution for the management of its domestic, commercial and

non-hazardous industrial solid waste, plus any other wastes for which it is responsible under agreements.

- In order to satisfy the requirements of the Environmental Assessment Act, it is necessary to identify a reasonable number of reasonable sites (i.e. alternatives) in the facility site selection process to permit a comparative evaluation of the sites.

- The site selection process should be rational, traceable and defensible. It should be conducted in consultation with the affected public.

- Metro will look first within its own boundaries to site its landfill facilities.

- The cost of transportation is not considered by Metro to be an exclusionary constraint. Therefore, if a reasonable number of reasonable sites are not identified within Metro, the study area will be expanded to include the remainder of Ontario. In this event, resort would be had to the Metropolitan Toronto Act (Part V, Section 66(2)), whereby Metro may acquire land, including by expropriation, for disposal of waste anywhere in Ontario. Under this Act, such acquisition must have the permission of the local municipality or, in absence of this, the approval of the Ontario Municipal Board.

- If waste management facilities are to be located outside of Metro, Metro would prefer to locate such facilities where there is a willing landowner or willing municipality (ie. willing host) provided that the site identification criteria that would be applied in a systematic site search of all of Ontario are also satisfied.

2.3 Goal

The goal of the landfill site selection process is to find a landfill site employing an approach that meets the requirements of the Environmental Assessment Act.

3.0 LANDFILL SITE SELECTION APPROACH

3.1 Overview of Three Phase Approach

Metro will first look within its own boundaries for potential sites for landfill facilities. If a reasonable number of reasonable sites (ie., sites that meet the identified criteria) are not available to permit a comparative evaluation, the study area will be expanded to include the remainder of Ontario on the basis described in the general premises.

Thus, the site selection approach involves the identification of sites through three sequential phases:

Phase 1	-	a systematic site search inside Metro;
Phase 2	-	a willing hosts site search in the remainder of Ontario; and
Phase 3	-	a systematic site search in the remainder of Ontario.

Within each phase, a series of steps will be followed to identify, through the application of criteria, candidate sites and, ultimately, if there are a reasonable number of candidate sites, a preferred site. The three-phase approach is illustrated in Figure 1 and the criteria are set out in Tables 1, 2 and 3.

3.1.1 Phase 1 - Systematic Site Search Inside Metropolitan Toronto

The systematic site search process inside Metro involves the identification of lands within a specific study area (i.e. Metro) that meet defined criteria. In Phase 1, the application of criteria to lands within Metro will permit the identification of Candidate Areas in which to locate a landfill facility. In this Phase, as in Phase 3, the landfill site selection process involves the use of Candidate 1 Areas and Candidate 2 Areas. Candidate 1 Areas are defined as areas where there is a higher probability of locating a site that has suitable geological and hydrogeological conditions for a landfill. Candidate 2 Areas are defined as areas where there is a lesser probability of locating a site that has suitable geological and hydrogeological conditions for a landfill. It should be emphasized that the use of Candidate 1 Areas and Candidate 2 Areas does not indicate that a site identified in a Candidate 2 Area is inherently

inferior to a site identified in a Candidate 1 Area from a geological and hydrogeological point of view.

Within Phase 1, Candidate 1 Areas will be identified first using the criteria set out in Table 1 (i.e. Step 1). The application of the criteria set out in Table 3 will permit the identification of Candidate Sites within Candidate 1 Areas (i.e. Step 2). If at the end of Step 2, the systematic site search has resulted in the identification of a reasonable number, or more, of reasonable sites, then a long list of sites is created. Refer to Figure 1.

On the other hand, if a reasonable number, or more, of reasonable sites has not been identified, then the application of the criteria set out in Table 2 will permit the identification of Candidate 2 Areas in which to locate a landfill facility (i.e. Step 1). The application of the criteria set out in Table 3 will permit the identification of Candidate Sites within Candidate 2 Areas (i.e. Step 2).

If, at the end of Step 2, the systematic site search process has resulted in the identification of a reasonable number, or more, of reasonable sites, then a long list of sites is created. An assessment of the long list is then conducted using criteria to obtain a short list of sites (i.e. Step 3). An assessment to obtain a short list is required only when the long list contains more than a reasonable number of reasonable sites. If the long list does not contain more than a reasonable number of reasonable sites, then it becomes the short list and Step 3 is unnecessary. In the next step, criteria are used to compare the sites on the short list in order to identify the Preferred Site (i.e. Step 4). Once the Preferred Site is identified, the process advances to the approval stage (i.e. Step 5).

On the other hand, if at the end of Step 2 for Candidate 2 Areas the systematic site search process within Metro fails to yield a reasonable number, or more, of reasonable sites, then instead of proceeding to Steps 3, 4 and 5, it is necessary to move to Phase 2.

3.1.2 Phase 2 - The Willing Host Site Search

Phase 2 involves the identification of willing host sites in the remainder of Ontario. It involves landowners or municipalities outside Metro in identifying lands they wish to offer for a landfill facility.

Letters sent to all municipalities in Ontario and advertisements placed in newspapers local to these municipalities will: i) invite municipalities to express their interest in hosting Metro's landfill facility and identify sites and ii) invite landowners and/or municipalities to offer sites. Landowners may only offer sites they own or control (i.e. no private third parties may offer sites). See Appendix B for sample letter and advertisement.

Once willing municipalities and landowners are identified, site criteria, set out in Table 3, are applied to the offered sites to identify Candidate Sites (i.e. Step 2). If this process adds Candidate Sites to the list of sites created in Phase 1, such that there is now a reasonable number, or more, of reasonable sites on the list, then the long list of sites is created. An assessment of this long list would then be conducted using criteria to obtain a short list of Candidate Sites (i.e. Step 3). As noted above, if the long list of sites is in fact the short list, then Step 3 is eliminated. The process can then move to a comparison of Candidate Sites to identify the Preferred Site (i.e. Step 4). Once the Preferred Site is identified, the process advances to the approval stage (i.e. Step 5). Refer to Figure 1.

If the combination of Candidate Sites from Phases 1 and 2 does not yield a reasonable number, or more, of reasonable sites, then the site identification process advances to include the remainder of Ontario (i.e. Phase 3).

3.1.3 Phase 3 - Systematic Site Search of the Remainder of Ontario

In Phase 3, the application of criteria, set out in Table 1, to lands in the remainder of Ontario will permit the identification of Candidate 1 Areas (i.e. Step 1). The application of criteria set out in Table 3 will permit the identification of Candidate Sites within the Phase 3, Candidate 1 Areas (i.e. Step 2). If, at the end of Step 2, the combination of sites from Phases 1 and 2 and

the Candidate 1 Areas in Phase 3 yields a reasonable number, or more, of reasonable sites, then the long list of sites is created. Refer to Figure 1.

On the other hand, if a reasonable number, or more, of reasonable sites has not been identified, then the application of criteria set out in Table 2 would permit the identification of Phase 3, Candidate 2 Areas in which to locate a landfill facility (i.e. Step 1). The application of criteria set out in Table 3 would permit the identification of Candidate Sites within the Candidate 2 Areas (i.e. Step 2).

If the combination of Candidate Sites from Phase 1, 2 and 3 yields a reasonable number, or more, of reasonable sites, then a long list of sites is created. An assessment of this long list is then conducted using criteria to obtain a short list of Candidate Sites (i.e. Step 3). As noted above, if the long list is in fact the short list, then Step 3 is eliminated. The process can then move to a comparison of Candidate Sites to identify the Preferred Site (i.e. Step 4). Once the Preferred Site is identified, the process advances to the approval stage (i.e. Step 5).

If the combination of Candidate Sites from Phases 1, 2 and 3 does not yield a reasonable number, or more, of reasonable sites, then the site selection process will have to be re-evaluated.

3.1.4 Criteria

In September 1988, the SWEAP Site Criteria Task Force Paper (attached as Appendix A) identified the following "criteria/concerns" which the Task Force believed should be considered when selecting sites for a landfill:

Water variables - Potential Pollution of Groundwater/Drinking Water.
Water variables - Flood plain.
Minimum distance to residential areas.
Ecologically sensitive areas.
Water Variables - minimum distance to waterbodies.
Heritage/Archaeological sites.
Subsurface soil type.

Conservation areas.
Agricultural lands.
Transportation.
Aggregate resources.

These "criteria/concerns" are consistent with the landfill site selection goal stated herein (ie. "... employing an approach that meets the requirements of the Environmental Assessment Act").

Having regard for the "criteria/concerns" identified by the Task Force and considering the overall site selection goal, specific criteria have been developed and are described in this report for: i) the identification of Candidate Areas (Tables 1 and 2) and ii) the identification of Candidate Sites (Table 3).

The following disciplines have identified criteria to be used to identify Candidate Areas: hydrogeology, land use, agriculture, natural environment and social. Hydrogeological criteria are used to delineate the two different types of Candidate Areas referred to earlier in the Discussion Paper. Since the other criteria used to identify Candidate Areas are based on more certain characteristics (such as, under land use, the presence of built-up areas), they are the same for both Candidate 1 and 2 Areas.

3.2 Site Size and Landfill Design Assumptions

As noted earlier, landfilling is a common component of the alternative waste management systems now being considered under SWEAP. However, until the overall waste management system is finalized, specific characteristics of the landfill component will not be known. Consequently, in the interim, assumptions pertaining to landfill site size and design must be made in order to identify and evaluate sites.

In applying the site selection process, the disposal of mixed domestic, commercial and non-hazardous industrial solid waste was assumed. The systems analysis in the Waste Management Master Plan will identify the number, size and type of landfills required.

3.2.1 Recommended Site Size Assumptions

The site size required for a landfill varies depending on needed capacity, site specific conditions and landfill design.

It is assumed that the landfill will operate for a minimum of 10 years and may operate up to 20 years. An operating life of less than 10 years is difficult to justify given the costs of approvals and lead time for site approval, tendering and construction of a new landfill site.

System Alternatives 1 and 2 in Discussion Paper 7.1 suggests a 10 year (i.e. 1991 to 2001) landfill capacity could be between 15 and 20 M tonnes. Assuming one landfill site, an appropriate total site area of between 150 and 200 ha would be required. Therefore, a minimum total landfill site size of 100 ha is assumed for the systematic site search approach. The ratio of length to width should be no greater than 4:1.

The landfill site size must allow for:

- refuse fill area;
- buffer zone around fill area;
- stockpile areas;
- access roads;
- weigh station;
- administration and maintenance buildings and parking areas;
- leachate collection and treatment facilities;
- gas collection and burning facilities;
- storm water control features (eg. ditches, sediment ponds).

3.2.2 Recommended Facility Design Assumptions

The landfill design will account for and mitigate as much as is reasonably possible the potential negative effects of landfill construction, operations, closure and after-use.

For the landfill site search, it is assumed that the following features will be included in the design and operation of Metro's landfill:

- Placement of liner, where appropriate.
- Collection and treatment of leachate.
- Cover placed daily over compacted waste.
- Gas collection and burning to control odours or produce energy.
- Final cover placed on top as part of site closure.
- Grass seeding and landscaping of cover.
- After-use typically open space and recreation.
- Buffer zone provided between property line and working area that may contain landscaped berm.
- High fence around perimeter of site.
- Weigh station.
- Administration and maintenance buildings.
- Monitoring of air, water and terrestrial environments during operational stage and after site closure.
- Monitoring of leachate and gas generation during operational stage and after site closure.
- Implementation of mitigative measures to control nuisance effects. For example:
  - vector and rodent control;
  - daily litter pick-up around site and along access routes;
  - dust control on site and along access routes; and
  - noise buffers.
- Designated access routes, where necessary.

3.3 Step 1 - Identify Candidate Areas

Whether it be within Phase 1 or 3, the first step in the selection process is to identify Candidate Areas. The Candidate Areas will be identified through the application of criteria described in Tables 1 and 2. This step is not necessary in Phase 2 (willing host) because sites, not areas, will be offered.

3.4 Step 2 - Identify Candidate Sites

The second step in all phases is to identify Candidate Sites, whether from within Candidate Areas or from sites offered by willing hosts. For Phases 1 and 3, a list of Candidate Sites is created by identifying sites within the Candidate Areas by applying the criteria shown in Table 3. Candidate 1 Areas will be considered before Candidate 2 Areas. If in either Phase 1 or 3, a reasonable number, or more, of reasonable sites are found in Candidate 1 Areas, Candidate 2 Areas will not be considered. For Phase 2, a list of Candidate Sites is created by applying the Candidate Site criteria in Table 3 to the willing host sites.

If upon completing Step 2 in any Phase in the site selection process, a reasonable number, or more, of reasonable sites have been identified, the long list of reasonable sites will have been created and the Candidate Site identification process need go no further.

3.5 Step 3 - Assess Long List of Candidate Sites to Obtain Short List of Candidate Sites

If there are more than a reasonable number of reasonable sites on the long list, further assessment will be carried out to create a short list of sites. The sites identified in this step will constitute the short list of sites and will be subject to a detailed site-specific comparative evaluation to determine the Preferred Site. If the long list of sites does not consist of more than a reasonable number of reasonable sites, this step will be omitted.

The characteristics of the long list of sites will be used to develop criteria for the assessment. Appendix C includes a master list of factors from which these criteria will be developed. This analysis will use a more detailed level of investigation and/or new criteria to assess the long list of sites. Secondary sources, agency contacts and reconnaissance field investigations will be used in the application of criteria. The reconnaissance field investigations may identify features not satisfying the criteria and result in site boundary refinement.

3.6 Step 4 - Compare Candidate Sites on Short List to Identify Preferred Site

Once a short list of Candidate Sites has been identified that meets the test of a reasonable number of reasonable sites, a comparative evaluation process will be undertaken on a site-specific basis.

The purpose of the comparative evaluation will be to select a Preferred Site. An intensive scrutiny of each site and an identification of differences between sites will allow comparisons to be made and the Preferred Site to be selected.

The criteria to be developed from the master list of factors will depend on the characteristics of the sites on the short list and therefore will be developed once the short list of sites has been obtained.

If the comparative evaluation of the short list of Candidate Sites does not identify a Preferred Site (i.e. Step 4), and Candidate Site identification in all three phases has not been completed, it is necessary to re-enter the phased approach to site selection. There are four points of re-entry:

i. Phase 1 - Candidate 2 Areas;
ii. Phase 2 - Willing Host Candidate Sites;
iii. Phase 3 - Candidate 1 Areas; or
iv. Phase 3 - Candidate 2 Areas.

The point of re-entry depends on the point of exit from the phased approach. Step 2 required an exit from the phased approach where the process had identified a long list of Candidate Sites. The point of re-entry will be the point immediately following the exit point. For example, if the process had identified a reasonable number, or more, of reasonable sites at the end of the identification of Phase 1 Candidate 2 Areas and Sites, then the point of re-entry would be Phase 2 willing host Candidate Sites.

Since Phase 3 includes lands in the remainder of Ontario, it is expected that, at the end of Step 2 in this Phase, a reasonable number, or more, of reasonable sites will have been

identified leading to the selection of the Preferred Site. If this does not happen, the site selection process will have to be re-evaluated.

3.7 Step 5 - Obtain Approvals for Preferred Site

Ultimately, proper documentation under the Environmental Assessment Act (EAA) and Environmental Protection Act (EPA) and other relevant legislation will be prepared and submitted to the approval authorities for each Preferred Site for a landfill facility.

3.8 Summary of Site Selection Approach

The site selection approach is summarized below:

Step 1: Identify Candidate Areas;

Step 2: Identify Candidate Sites;

Step 3: Assess Long List of Candidate Sites to Obtain Short List of Candidate Sites;

Step 4: Compare Candidate Sites on Short List to Identify Preferred Site;

Step 5: Obtain Approvals for Preferred Site.

The approach is further summarized in Figure 1.

3.9 Siting of Subsequent Landfill Facilities

As noted earlier, after the first preferred landfill site is selected, the siting process described in this report can be followed a subsequent time to identify a subsequent Preferred Site for a landfill facility, should Metro choose to do so. In this regard, Candidate Sites which were not selected as the Preferred Site under the previous process are eligible for consideration in the subsequent process.

4.0 PUBLIC PARTICIPATION

Public involvement is an essential part of Metro's solid waste environmental assessment program. Since the beginning of the planning process, the public has been involved in the design and the implementation of advisory caucuses, representing different sectors of the public, a multi-stakeholder committee, representing all of the advisory caucuses, and occasional task forces which have worked on specific issues. (This public participation program is described in detail in other SWEAP documents).

The intent of the public participation process is to provide all those who may be affected by the waste management master planning process (the "affected parties"), an opportunity to participate in the development of the plan before it is submitted to the Minister of the Environment by Metropolitan Council. Since representatives of the various sectors that generate, manage or are otherwise concerned with waste within Metro are, by definition, affected parties, Metro has sought out their participation through the Advisory Caucuses. Any other groups of individuals who feel that they are or may become affected by Metro's solid waste master planning can have access to all the SWEAP documents and their comments will be recorded and taken into account in all further planning.

In addition, Metro considers that those who live in communities where waste management facilities may be sited will become affected parties as soon as potential sites are identified and should be actively invited to participate in Metro's planning process. For this reason, it is Metro's intention to initiate activities to facilitate participation by all interested residents in each community neighbouring a short-listed site, as well as by all those who actively propose that a site in their area be considered.

The exact nature of the activities which Metro will undertake in each such community will be determined, to the degree possible, in consultation with existing community groups near each potential site. It is Metro's intention to provide opportunity for public input on site-specific matters as well as on site selection process and Metro's Solid Waste Management Master Plan as a whole.

5.0 GLOSSARY

Areas of Natural and Scientific Interest (ANSI)

Areas of land and water containing natural landscapes or features which have been identified as having values related to protection, natural heritage, scientific study or education (Ministry of Natural Resources).

Attenuation

The reduction in concentration of specific constituents within landfill leachate through time and space by one or more of the following physical, chemical or biological mechanisms: dilution, precipitation, sorption, diffusion, biodegradation, bio-uptake, evaporation.

Bevelled Clay

Clay e.g. glacial till deposits that do not exhibit hummocky terrain caused by moraines, drumlins, kames, eskers or other glacial landforms.

Buffer Zone

A space, feature or land use interposed between two conflicting land uses for the purpose of reducing or eliminating the adverse effects of one land use upon another. A buffer may be open space, where distance alone is relied upon to produce the desired results, or it may be a berm, wall, trench, fence of other structure or plantings, or other land use different from the two conflicting ones, but compatible with both (Ministry of the Environment).

Candidate Areas

Those lands that meet the criteria described in Tables 1 and 2 (i.e. Step 1 in Phases 1 and 3).

Candidate Sites

Those lands that meet the criteria described in Table 3 (i.e. Step 2 in all Phases).

Comparative Evaluation

The application of comparative evaluation criteria to the short list of Candidate Sites leading to the selection of the Preferred Site for a landfill facility.

Containment

Retention within property boundaries of landfill gases or leachate such that the off-site migration of specific constituents of the gas or leachate is maintained within established limits or criteria.

Co-Siting

The siting of two or more waste management facilities on the same site. For example, the siting of a compost facility with a landfill.

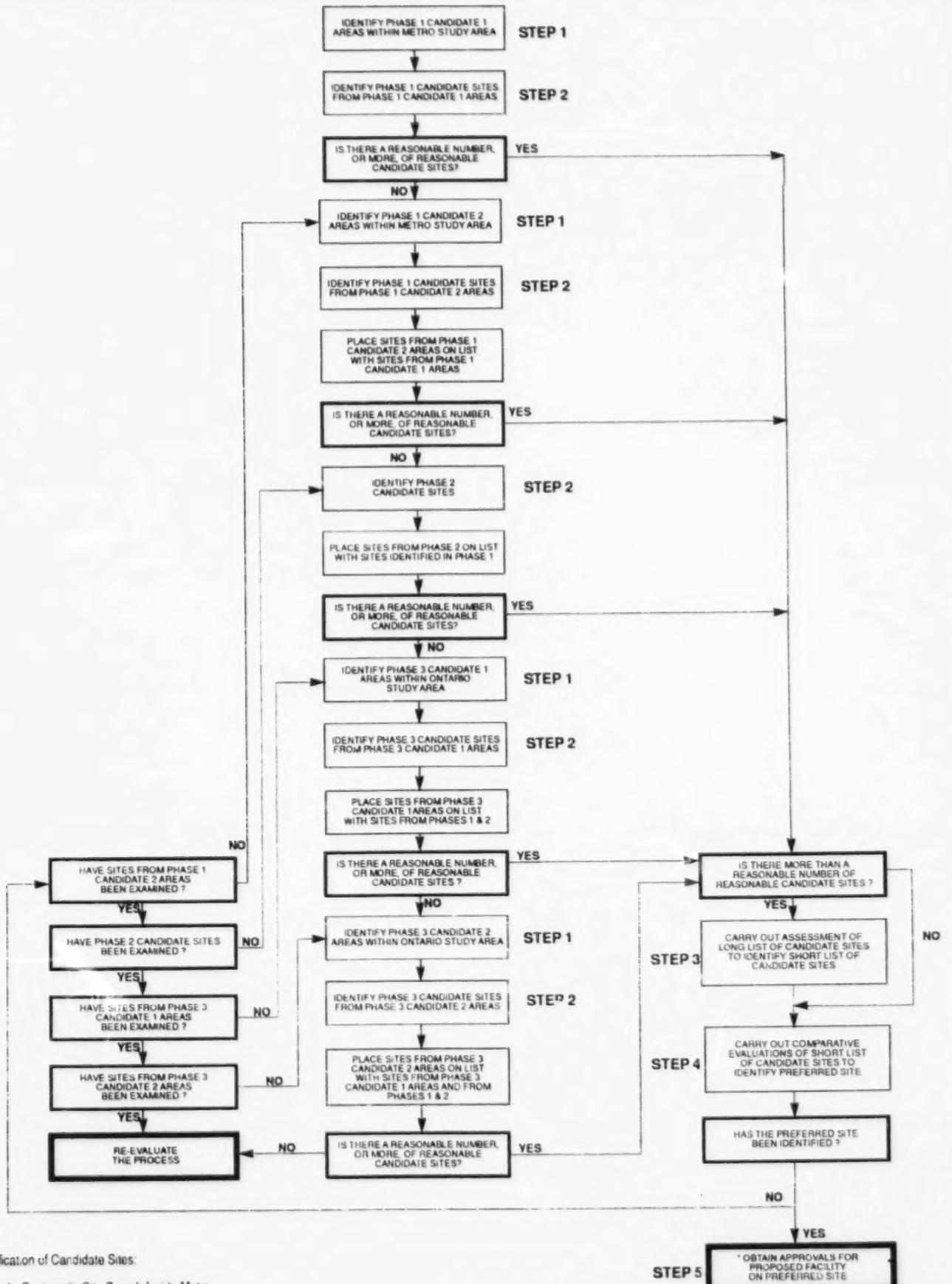
Criteria

Specific standards used to assess the suitability of land for a landfill.

Endangered Species	Indigenous plants or animals and their habitats that are protected under the Ontario Endangered Species Act.
Engineered Barrier	A synthetic or natural material of low permeability, the purpose of which is to restrict the migration of liquids or gases. Containment which is accomplished at least partially by the application of engineered works.
Exclusionary Constraint	An indicator used to identify lands that will be excluded from further consideration in the site search process.
Factor	Characteristics used to consider the suitability of land for a landfill.
Glacial Overburden	Soil (unconsolidated material) emplaced by or modified by the action of glacial ice or the melting of glacial ice.
Lacustrine Clay	Clay deposits emplaced due to sedimentation of clay-sized particles within deep water environments in glacial or post-glacial lakes.
Landfill	A waste disposal site operating under a Certificate of Approval as a landfilling site and authorized to accept for landfilling only domestic waste in combination with either or both commercial waste or industrial waste but not including liquid waste or hazardous waste (Ministry of the Environment).
Long List of Candidate Sites	A list of sites containing a reasonable number, or more, of Candidate Sites.
Major Regional Aquifer	Aerially extensive productive aquifer identified in Ontario Ministry of Natural Resource Publication 5932 "Water Quantity Resources of Ontario".
Marine Clay	Clay deposits emplaced due to sedimentation of clay-sized particles within deep water environments of salt water (sea or ocean) basins.
Natural Attenuation	Removal of landfill leachate constituents to background levels by natural processes such as sorption, precipitation, biological uptake or degradation. Dilution to background levels can be included as an attenuation process.
Natural Containment	Containment which is accomplished by the naturally occurring physical hydrogeological conditions at a site.

Non-Agricultural Land	Land which is currently and irreverably used for non-agricultural use or which is committed in a municipal official plan to future non-agricultural uses.
Overburden Aquifer	An overburden consisting of sufficient permeability and containing potable ground water to allow support of reliable water supply wells.
Preferred Site	The recommended site for a landfill facility that is identified as a result of comparative site evaluations.
Regional Precambrian Faults	Large structural fault traceable over tens to hundreds of miles, as depicted on Geological Survey of Canada Map 1251A "Tectonic Map of Canada".
Secondary Source Information	Information which is obtained from existing published or unpublished data sources.
Short List of Candidate Sites	A list of sites containing a reasonable number of Candidate Sites.
Site Selection Goal	The overall goal of the site selection process.
Study Area	The geographic area which is examined in the search for the preferred landfill site.
Surficial Geology	Geological conditions (soil type, structure) exposed at ground surface.
Urban Shadow	Areas undergoing a transition from agricultural to non-agricultural uses as a result of urban expansion pressures.
Waste Management Master Plan	A document describing a solid waste management system to serve a municipality for a defined period of time.

FIGURES AND TABLES


IDENTIFY PHASE 1 CANDIDATE 1 AREAS WITHIN METRO STUDY AREA
STEP 1
IDENTIFY PHASE 1 CANDIDATE SITES FROM PHASE 1 CANDIDATE 1 AREAS
STEP 2
IS THERE A REASONABLE NUMBER, OR MORE, OF REASONABLE CANDIDATE SITES?
YES
NO
IDENTIFY PHASE 1 CANDIDATE 2 AREAS WITHIN METRO STUDY AREA
STEP 1
IDENTIFY PHASE 1 CANDIDATE SITES FROM PHASE 1 CANDIDATE 2 AREAS
STEP 2
PLACE SITES FROM PHASE 1 CANDIDATE 2 AREAS ON LIST WITH SITES FROM PHASE 1 CANDIDATE 1 AREAS
IS THERE A REASONABLE NUMBER, OR MORE, OF REASONABLE CANDIDATE SITES?
YES
NO
IDENTIFY PHASE 2 CANDIDATE SITES
STEP 2
PLACE SITES FROM PHASE 2 ON LIST WITH SITES IDENTIFIED IN PHASE 1
IS THERE A REASONABLE NUMBER, OR MORE, OF REASONABLE CANDIDATE SITES?
YES
NO
IDENTIFY PHASE 3 CANDIDATE 1 AREAS WITHIN ONTARIO STUDY AREA
STEP 1
IDENTIFY PHASE 3 CANDIDATE SITES FROM PHASE 3 CANDIDATE 1 AREAS
STEP 2
PLACE SITES FROM PHASE 3 CANDIDATE 1AREAS ON LIST WITH SITES FROM PHASES 1 & 2
IS THERE A REASONABLE NUMBER, OR MORE, OF REASONABLE CANDIDATE SITES ?
YES
NO
IDENTIFY PHASE 3 CANDIDATE 2 AREAS WITHIN ONTARIO STUDY AREA
STEP 1
IDENTIFY PHASE 3 CANDIDATE SITES FROM PHASE 3 CANDIDATE 2 AREAS
STEP 2
PLACE SITES FROM PHASE 3 CANDIDATE 2 AREAS ON LIST WITH SITES FROM PHASE 3 CANDIDATE 1 AREAS AND FROM PHASES 1 & 2
IS THERE A REASONABLE NUMBER, OR MORE, OF REASONABLE CANDIDATE SITES?
YES
NO
RE-EVALUATE THE PROCESS
HAVE SITES FROM PHASE 3 CANDIDATE 2 AREAS BEEN EXAMINED ?
YES
NO
HAVE SITES FROM PHASE 3 CANDIDATE 1 AREAS BEEN EXAMINED ?
YES
NO
HAVE PHASE 2 CANDIDATE SITES BEEN EXAMINED ?
YES
NO
HAVE SITES FROM PHASE 1 CANDIDATE 2 AREAS BEEN EXAMINED ?
YES
NO
IS THERE MORE THAN A REASONABLE NUMBER OF REASONABLE CANDIDATE SITES ?
YES
NO
STEP 3
CARRY OUT ASSESSMENT OF LONG LIST OF CANDIDATE SITES TO IDENTIFY SHORT LIST OF CANDIDATE SITES
STEP 4
CARRY OUT COMPARATIVE EVALUATIONS OF SHORT LIST OF CANDIDATE SITES TO IDENTIFY PREFERRED SITE
HAS THE PREFERRED SITE BEEN IDENTIFIED ?
NO
YES
STEP 5
* OBTAIN APPROVALS FOR PROPOSED FACILITY ON PREFERRED SITE

Identification of Candidate Sites:

Phase 1: Systematic Site Search Inside Metro
Phase 2: Willing Host Site Search
Phase 3: Systematic Site Search in the Remainder of Ontario

* Approvals will be sought for each facility on each site on an individual basis

SITE SELECTION PROCESS - LANDFILL

FIGURE 1

TABLE 1

CANDIDATE 1 AREA CRITERIA AND LEVEL OF DETAIL OF INFORMATION

	Hydrogeology	Agriculture	Land Use	Social	Natural Environment
Criteria	• Lands with the following surficial geology: - lacustrine/marine clay or - bevelled clay glacial till or - bedrock and • Lands with all of the following characteristics: - >30 m thickness of material with permeability of $<5 \times 10^{-7}$ cm/sec. and - no regional aquifers or regional precambrian faults	In Southern Ontario: • Non-agricultural land or • Non-specialty crop area within urban shadow or • Publicly owned non-specialty crop areas on CLI* Class 3 soil with low to medium economic activity or • Publicly owned non-specialty crop areas on CLI Classes 4-7 soil with high economic activity or • Non-specialty crop areas on CLI Classes 4-7 soil with low to medium economic activity In Northern Ontario: • Non-agricultural land or • CLI Class 4 soil not cleared of trees or • CLI Classes 5-7 soil	• Lands not developed for urban purposes (i.e. cities, towns, villages, hamlets, etc.) and • Lands in buffer areas around uses which are compatible with a landfill or • Lands in rural areas which are publicly owned and where landfill is compatible with existing uses or • Rural areas (defined as land not to be developed within life of landfill)	• Lands 500 m or further from developed residential areas (hamlets and larger) and • Lands not in Indian Reserves, unless offered under the willing host phase, and • Lands not under Native land claims filed before January 1, 1990** and • Lands not in Provincial or Federal Parks and • Lands not in Conservation Authority Area Parks	• Lands not in Provincially or Federally designated natural areas with appropriate buffers
Level of Detail and Source of Information	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. surficial geology maps)	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. soil capability maps, census data) • Agency contact	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. Ontario Base Maps) • Agency contact	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. Ontario Base Maps) • Agency contact	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. Ontario Base Maps) • Agency contact

* CLI - Canada Land Inventory

** This may be subject to change

TABLE 2

CANDIDATE 2 AREA CRITERIA AND LEVEL OF DETAIL OF INFORMATION

	Hydrogeology	Agriculture	Land Use	Social	Natural Environment
Criteria	Lands in lacustrine/ marine clay with: • $K < 5x10^{-7}$cm/sec; <30m thickness; no regional aquifer or regional precambrian fault, or • $K < 5x10^{-7}$cm/sec; >30m thickness; over a regional bedrock aquifer or regional precambrian fault, or • $5x10^{-7} < K < 5x10^{-6}$ cm/sec; >30m thickness; no regional aquifer or regional precambrian fault or Lands in glacial overburden with: • $K < 5x10^{-7}$cm/sec; >30m thickness of bevelled clay glacial till; over regional bedrock aquifer or regional precambrian fault, or • $K < 5x10^{-7}$cm/sec; <30m thickness of bevelled clay glacial till; no regional aquifer or regional precambrian fault, or	In Southern Ontario: • Non-agricultural land or • Non-specialty crop area within urban shadow or • Publicly owned non-specialty crop areas on CLI* Class 3 soil with low to medium economic activity or • Publicly owned non-specialty crop areas on CLI Classes 4-7 soil with high economic activity or • Non-specialty crop areas on CLI Classes 4-7 soil with low to medium economic activity In Northern Ontario: • Non-agricultural land or • CLI Class 4 soil not cleared of trees or • CLI Classes 5-7 soil	• Lands not developed for urban purposes (i.e. cities, towns, villages, hamlets, etc.) and • Lands in buffer areas around uses which are compatible with a landfill or • Lands in rural areas which are publicly owned and where landfill is compatible with existing uses or • Rural areas (defined as land not to be developed within life of landfill)	• Lands 500 m or further from developed residential areas (hamlets and larger) and • Lands not in Indian Reserves, unless offered under the willing host phase, and • Lands not under Native land claims filed before January 1, 1990** and • Lands not in Provincial or Federal Parks and • Lands not in Conservation Authority Area Parks	• Lands not in Provincially or Federally designated natural areas with appropriate buffers

	Hydrogeology	Agriculture	Land Use	Social	Natural Environment
Criteria (cont'd)	• $K < 5x10^{-7}$cm/sec; >30m thickness of not bevelled clay glacial till; no regional aquifer or regional precambrian fault, or • $5x10^{-7} < K < 5x10^{-6}$ cm/sec; >30m thickness of bevelled clay glacial till; no regional aquifer or regional precambrian fault or Lands on bedrock with: • $K < 5x10^{-7}$ cm/sec; >30m thickness; over a regional aquifer or regional precambrian fault, or • $5x10^{-7} < K < 5x10^{-6}$ cm/sec; >30m thickness; no regional aquifer or regional precambrian fault				
Level of Detail and Source of Information	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. surficial geology maps)	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. soil capability census data) • Agency contact	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. Ontario Base Maps) • Agency contact	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. Ontario Base Maps) • Agency contact	• Mapped at 1:25,000 (Metro) • Mapped at 1:250,000 (Ontario) • Secondary source information (e.g. Ontario Base Maps) • Agency contact

* CLI - Canada Land Inventory
** This may be subject to change

TABLE 3

SITE IDENTIFICATION CRITERIA AND LEVEL OF DETAIL OF INFORMATION

	Hydrogeology	Agriculture	Land Use	Social	Natural Environment	Surface Water
Criteria	• The site should have adequate attenuation/ containment properties in 3 dimensions without total reliance on engineered barriers. • The hydrostratigraphy should be comprehensible and predictable such that the performance of the site can be readily monitored and, if necessary, contingency measures can be effectively implemented NOTE: There may be many combinations of physical and chemical hydrogeological conditions present at any given site which would allow the site to meet the site identification criteria. In order to assess the potential suitability of a site in light of these criteria, the following indicators will be considered: • overburden geology/ hydrostratigraphy • bedrock geology/ hydrostratigraphy • permeability	In Southern Ontario: • Non-agricultural land or • Non-specialty crop areas within urban shadow or • Publicly owned non-specialty crop areas on CLI* Class 3 soil with low to medium economic activity or • Publicly owned non-specialty crop areas on CLI Classes 4-7 soil with high economic activity or • Non-specialty crop areas on CLI Classes 4-7 soil with low to medium economic activity • Avoid unnecessary agricultural property fragmentation • Avoid areas of large scale agricultural infrastructure In Northern Ontario: • Non-agricultural land or • CLI Class 4 soil not cleared of trees or • CLI Classes 5-7 soil • Avoid unnecessary agricultural property fragmentation • Avoid areas of large scale agricultural infrastructure	• Lands not developed for urban purposes (i.e. cities, towns, villages, hamlets, etc.) and • Lands in buffer areas around uses which are compatible with a landfill or • Lands in rural areas which are publicly owned and where landfill is compatible with existing uses or • Rural areas (defined as land not to be developed within life of landfill)	• Lands 500 m or further from developed residential areas (hamlets and larger) and • Lands not in Indian Reserves, unless offered under the willing host phase, and • Lands not under Native land claims filed before January 1, 1990 and • Lands not in Provincial or Federal Parks and • Lands not in Conservation Authority Area Parks • Lands not in Federally, Provincially or Regionally significant recreation areas/ facilities	• Lands not in**: - Provincially or federally designated natural areas or - Areas with endangered species and their habitat or - Provincially and regionally significant life science ANSI's or - Provincially and regionally significant wetlands and lands of Canada Land Inventory capability classes 1-3 for waterfowl production or - Cold water and major warm water fisheries or - Municipally designated natural areas	• Lands outside designated flood plain areas as identified by appropriate government authority

	Hydrogeology	Agriculture	Land Use	Social	Natural Environment	Surface Water
Criteria (Cont'd)	• hydraulic gradients (vertical and horizontal) • ground water elevations • ground water recharge and discharge areas • ground water chemistry • current and potential ground water use (aquifers) • location and number of ground water receptors					
Level of Detail and Source of Information	• Mapped at 1:25,000 • Air photo interpretation • Secondary source information (e.g. well records)	• Mapped at 1:25,000 • Air photo interpretation • Secondary source (e.g. OMAF agricultural systems map) • Agency contact	• Mapped at 1:25,000 • Secondary source (e.g. Official Plan documentation) • Agency contact	• Mapped at 1:25,000 • Secondary source (e.g. Official Plan documentation) • Agency contact	• Mapped at 1:25,000 • Secondary source (e.g. Ontario Base Maps) • Agency contact	• Mapped at 1:25,000 • Secondary source (e.g. Ontario Base Maps) • Air photo interpretation • Agency contact

* CLI - Canada Land Inventory

** Any landfill site should be outside appropriate buffers around these areas.

APPENDIX A

SITE CRITERIA

ISSUES TO BE ADDRESSED BY SWEAP

Prepared by:

SWEAP Task Force #1

September, 1988.

Authors:

Pat Mohr
Diana Spear
Alex Brooks-Joiner

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- RANKING OF SITE CRITERIA
- RATIONALE FOR RANKING
- COMPARATIVE EVALUATION FACTORS
- OTHER CONSIDERATIONS

I. ORIGINAL MANDATE OF TASK FORCE #1

*To make recommendations on what factors/criteria should be considered when selecting sites for landfill, incineration, composting or recycling.

*To rank the criteria for each type of facility.

*To suggest how the criteria can be used to make comparative evaluations of the actual sites.

II. SOME GENERAL COMMENTS

*We are aware that we may have missed some criteria or factors or rationale in this report. However, the underlying principle of all the criteria is that we don't want any hazardous effects associated with any of the facilities - either in the near future or affecting future generations. We hope that by applying these criteria to the different facilities, the site selection processes for SWEAP will be socially responsible and ecologically sound.

*The criteria listed on the next pages should be seriously considered in selecting sites for the different kinds of waste management facilities. However, in meeting these criteria, it is also important not to hide the problems associated with our garbage. These sites should be located within a reasonable distance from the generating community, within the borders of the municipality/region. The sites must be in view of the public to remind us that we have to keep reducing waste at the source.

Citizens of a municipality will not acknowledge responsibility for their wastes unless they are confronted with all the stages of the waste management process. Therefore, ideally, management of wastes, including "disposal" must take place within the immediate area of generation (e.g., daily commutershed).

Obviously, hazardous waste needs special treatment and may need to be transported to a facility outside the source municipality. However, every effort should be made to ensure all citizens are aware of the responsibilities they must take for their wastes.

*In the criteria listed on the following pages, we have made a somewhat artificial separation between health and environmental criteria. This separation is largely to facilitate the reader. In reality, health and environmental quality cannot be separated. Releasing toxic chemicals into the environment - our ecosystem, will ultimately expose us to the health risks associated with those chemicals. Our good health depends heavily on an environment

free of toxic contaminants.

Buffer zones are mentioned as a criterion for several of the facilities. We feel very strongly that buffer zones are an essential and integral part of any waste management facility. The need for and extent of a buffer zone varies with the different kinds of facilities. For example, berms, trees and distance may be needed for landfills, while industrial zoning for a 3 block perimeter may be appropriate for a materials recovery facility.

*Existing public utility and transportation corridors can act as buffer area. Therefore, it may be advantageous to site a waste management facility adjacent to such corridors.

*If a waste management facility is sited in a non- residential area, it is critical that the selected area and the land around the site is zoned non-residential to avoid problems in the future, particularly after the facility has closed down or has been replaced.

*Some innovative communities have built community/recreational facilities in conjunction with the waste management facilities. For example, swimming pools, community centres, green space in the buffer zones. This is one way of making waste management facilities more acceptable to the receiving community. A needs assessment of the community should be performed to determine what kind of agreement can be reached. In some cases, the waste management facility may generate a product that can be useful at the community facility, e.g. compost. The decision to construct a multi-use facility may also be used in the comparative evaluation of several sites.

III . SITE CRITERIA/CONCERNS FOR A LANDFILL FACILITY

RANKING OF SITE CRITERIA:

Task Force #1 ranked the screening criteria as follows:

(1) Water variables - Potential Pollution of Groundwater/Drinking Water.
(1) Water variables - Flood plain.
(2) Minimum distance to residential areas.
(2) Ecologically sensitive areas.
(3) Water Variables - minimum distance to water bodies.
(3) Heritage/Archaeological sites.
(4) Subsurface soil type.
(5) Conservation areas.
(6) Agricultural lands.
(7) Transportation.
(8) Aggregate Resources.

The numbers indicate relative importance of the criteria. (1) is most important and (8) is least important. Where different criteria have the same number, it means that they have the same level of importance.

RATIONALE FOR RANKING:

The screening criteria were discussed and justified as follows:

(1) Water variables:

(1.1) Avoid the pollution of groundwater which is a source of drinking water for well users and has many far reaching ecological implications.

(1.2) Not on flood plain
(a) avoid

(1.3) Sufficient distance from water bodies (lakes, rivers, streams) to avoid seepage of contaminants from landfill.
(a) We do not know enough about geologic principles to specify how far this distance should be, but systems such as purge wells need to be located a certain distance from bodies of water in order to be at all effective.

(2) Distance to landfill from residential areas:

(a) Important because of:

HEALTH

- stress - social and psychological implications at individual and community level.
- potential hazards associated with methane leakages
- dust, litter & fumes from trucks
- increased traffic from trucks & their associated impacts

AESTHETICS

- noise (traffic, operations etc.)
- odours (and poisonous gases)
- visual effects e.g., blowing paper, description of landscape

- property value decreases
- birds - mainly seagulls

(b) Factors to be considered in defining a minimum distance should include prevailing winds.

(2) Not in an ecologically sensitive area and at least some minimum distance from an ecologically sensitive area.

(a) We do not have enough knowledge to specify a minimum distance from an ecologically sensitive area, but feel that the distance should be great enough so as not to disrupt the balance of the existing ecological systems.

(b) We would like to see ecological experts involved in the decision about specifying minimum distance and in defining ecologically sensitive areas.

(3) Not on a heritage or archaeological site and not close enough to damage the site physically or aesthetically.

(a) These sites are irreplaceable. They can continue to provide educational and cultural enrichment. Certain sites may be indigenous people's burial grounds and should not be desecrated.

(b) We would like to see historians and archaeologists involved in defining heritage and archaeological sites and provide information specifying possible minimum distances for different heritage and archaeological sites.

(4) Subsurface Soil Type: subsurface soil should have low degree of porosity.

(a) Minimize waste contamination in case of leachable collection failures.
(b) We do not have enough knowledge to specify what a "minimum porosity" is.

(5) Not in or near a Conservation area or other recreational lands.

(a) These areas have already been designated as valuable resources.

(6) Not on C.L.I. Class I, II, or III agricultural lands.

(a) This type of land is an irreplaceable resource in Ontario.

(7) Transportation variables: no truck routes through urban areas, except industrial areas.

(a) Health and aesthetic considerations.

(b) Avoid ecologically sensitive areas, conservation areas, and archaeological sites.
(c) Increased congestion on roads and increased damage to these roads.
(d) Potential for increased accidents.

(8) Not on sites containing aggregate resources.

(a) These are irreplaceable resources and come from subsoils which provide the worst type of natural sealant.

COMPARATIVE EVALUATION FACTORS:

These factors should be used to compare different sites:

1. Site search and development costs
2. Reliability, size and service level
3. Same municipality as the generating facility.

IV. SITE CRITERIA/CONCERNS FOR A COMPOSTING FACILITY

RANKING OF SITE CRITERIA:

Composting site criteria were discussed and ranked as follows:

(1) Public Health & Safety (vectors, occupational)
(2) Noise & Odour - composting/leachate treatment
(3) Natural Environment (land, air, water, leachable treatment system)
(3) Heritage & Archaeological features
(4) Transportation of Wastes to Compost------Site
(5) Public Accessibility of Compost (farmers, etc.)
(6) Hydrogeology

The numbers indicate the order of relative importance of the site criteria. (1) is the most important and (6) is the least important. Where 2 criteria have the same number, it means that they are ranked equally.

RATIONALE FOR RANKING:

Rationale for these criteria are similar to those for the landfill site.

Some additional comments were made and the numbers correspond to the numbers listed previously:

(1) Public Health and Safety (vectors, and others listed below);
Occupational Health & Safety;
(2) Noise and odour controls for each facility and its treatment plant;
(3) Avoid heritage and archaeological features - a buffer zone is needed here too.
(4) Transportation to and from site, avoid residential areas and dense urban areas, avoid routes that would further congest traffic and that is accessible to the public (farmers, nurseries, gardeners, etc.);
(5) Public Accessibility of Compost - Compost has other uses as well as soil conditioner/ fertilizer. For example, concrete-type materials can be made from compost for use in sound barriers and slope stabilization. These other uses should be considered during site selection to facilitate the end use and distribution of the compost.
(6) Hydrogeology; not in flood prone area or near streams, etc. (site should have complete control over its leachate - concreted in, proper drainage files, etc.)

COMPARATIVE EVALUATION:

These factors should be used to compare different sites:

1. Sizing - few big sites or several smaller sites or both, depending on what goes to each site for the production of various types of compost;
2. Buffer Zone and Zoning (industrial lands, very poor agricultural lands are preferred);
3. Site may need further controls/additions to its facilities beyond those listed within the Certificate of Approval.

V. SITE CRITERIA /CONCERNS FOR AN INCINERATION FACILITY

RANKING OF SITE CRITERIA:

The site criteria for an incineration facility were ranked as follows:

(1) Public Health and Safety
(1) Natural Environment - Air
(2) Natural Environment - Land
(2) Natural Environment - Water
(2) Noise, Odours and Dust
(3) Transportation
(3) Heritage and Archaeological sites

The numbers indicate the order of relative importance of the site criteria. (1) is the most important and (3) is the least important. Where 2 criteria have the same number, it means they are equally important.

RATIONALE FOR RANKING:

(1) Public Health and Safety:

- A risk assessment is needed at each potential site to take into account the total chemical exposure of the downwind population.

- The public should be involved in deciding what is an acceptable risk.

- The selected site must minimize the public's exposure to disease vectors, such as birds, insects, rats.

- Occupational health and safety standards should be rigorously adhered to and care should be taken to protect the public from accidental and chronic health hazards.

- The selected site/facility should create minimal social impacts. Although standard social impacts (e.g., noise and odour) can often be mitigated by technological solutions, site selection can influence the magnitude of such impacts. Similarly, special social impacts often result from when the public fears potential health risks or feels a lack of control over their community. If these social impacts persist in the long term, they can cause serious health effects such as stress related symptoms.

(1) Air:

- There are two general types of air emissions from incinerators, stack emissions and fugitive emissions from operations. In order to minimize the environmental and social impacts of stack emissions, the incinerator should avoid emitting pollutants downwind to residential areas, farmlands or water resources, regardless of the levels of technology employed.

- In order to minimize public exposure to fugitive emissions from the incinerator, locating the facility in an industrial area or providing a significant buffer zone should be considered and dust control measures should be implemented.

(2) Land:

- In selecting a suitable incinerator site, it is impossible to separate it from the issue of ash disposal. Incinerator ash can contain many toxic chemicals. Similarly, the ash leachate can be highly contaminated. Therefore, it is essential that a site is available which can receive

hazardous waste, such as incinerator flyash. Furthermore, toxic elements such Hg should be prevented from entering the incinerator and scrap metals should be extracted from the ash to minimize total chemical loading to the ecosystem.

(2) Water:

- Again, leachate from the ash disposal is a major concern at the receiving hazardous waste site.

- Also, the fallout of atmospheric emissions into water resources should be considered in the site selection of the incinerator.

- If contaminated wastewaters are generated at the incinerator, treatment should be available on site. This affects the amount of space needed for an incinerator facility and may affect siting choices.

- If wastewater treatment on site is not possible due to the technology or space required, then the wastewater could be transported to an appropriate treatment facility. However, impacts along the transportation routes should also be considered (see comments below on TRANSPORTATION).

(2) Noise, Odours and Dust:

- The noise of trucks loading and unloading ash and garbage and of the incinerator itself require that the incinerator is located in an industrial area. Alternatively, a significant buffer zone is needed and the impacts of truck traffic assessed.

- Odours and dust from the stack emissions, the raw garbage and the trucks' exhaust contribute to the social impacts of the selected sites.

(3) Transportation :

- The site selection should consider the transportation of waste to the incinerator as well as ash away from the incinerator.

- Routes of access in an urban setting are major factors in selecting a site. These routes should avoid institutions, such as hospitals and schools and residential areas and should favor industrial areas.

- The vehicles transporting waste and ash should be viewed as mobile waste facility sites. As such, the same criteria should apply to the selection of access routes as apply to the selection of the incinerator site.

(3) **Heritage and Archaeological Sites:**

• These are irreplaceable resources and should be preserved for future generations.

Size and Number:

• The size and number of incinerators is partly determined by the design of the facility, the energy demand (if it is EFW) and the availability of fuel (i.e., non-recyclable combustible garbage).

• It is difficult to make general statements about a favourable location because the design, type and size of the facility has considerable bearing on whether or not the site is physically suitable and socially acceptable. For example, a smaller incinerator may be more readily accepted near a residential community than a larger incinerator. However, the energy demand, fuel supply (available waste) and incinerator technology may not be compatible with the smaller size incinerator.

• The site selection for incinerators should consider how many incinerators (or other sources of air emissions) there are in the neighbourhood and how large such facilities are. oIt is important that the site selection is made from the broadest possible perspective, i.e., taking into account the concerns and criteria listed here.

VI. SITE CRITERIA/CONCERNS FOR A TRANSFER STATION/MATERIALS RECOVERY STATION

RANKING OF SITE CRITERIA:

Site Criteria were ranked as follows:

(1) Public Health and Safety
(2) Transportation
(2) Natural Environment - Water
(2) Noise, Odours and Dust
(2) Heritage and Archaeological features

The numbers indicate the order of relative importance of the site criteria. (1) is the most important and (2) is less important. Where 2 criteria have the same number, it means that they are ranked equally.

RATIONALE FOR RANKING:

(1) Public Health and Safety:

• The selected site must minimize the public's exposure to disease vectors, such as birds, insects, rats.

• Occupational health and safety standards should be rigorously adhered to and care should be taken to protect the public from accidental hazards.

• The selected site/facility should create minimal social impacts. Although standard social impacts (e.g., noise, odour) can often be mitigated by technological solutions, site selection can influence the magnitude of such impacts. Similarly, special social impacts often result from when the public fears potential health risks or feels a lack of control over their community. If these social impacts persist in the long term, they can cause serious health effects such as stress related symptoms.

(2) Transportation:

• The site selection should consider the transportation of waste to and from the transfer station.

• Routes of access in an urban setting are major factors in selecting sites. The route should avoid institutions, such as hospitals, schools and residential areas and should favour industrial areas.

•The vehicles transporting waste and ash should be viewed as mobile waste facility sites. As such, the same criteria should apply to the selection of access routes as apply to the selection of the transfer station site.

(2) Water:

• Leachate draining from the garbage can contain insecticides and deodorizers as well as chemical leachate from the garbage itself. This leachate should be tested for hazardous chemicals. Then the leachate should be contained in a closed interceptor tank and transported to an appropriate treatment facility (e.g., on-site treatment facility at a landfill).

(2) Noise, Odours and Dust:

• The noise of trucks loading and unloading garbage at the transfer station require that the station is located in an industrial areas. Alternatively, a significant buffer zone is needed and the impacts of truck traffic assessed.

• Odours and dust from the transfer station, the raw garbage and the trucks' exhaust contribute to the social impacts of the selected and further justify the need for a buffer zone near residential areas.

(2) Heritage and Archaeological Features:

• These features are irreplaceable and should be avoided for the siting of all waste management facilities including transfer stations.

COMPARATIVE EVALUATION:

Size and Number:

• The size and number of transfer stations is partly determined by the design of the selected waste management system for SWEAP.

• It is difficult to make general statements about a favourable location because the design, type and size of the facility has considerable bearing on whether or not the site is physically suitable and socially acceptable. For example, a smaller transfer station may be more readily accepted near a residential community than a larger transfer station.

• The site selection for transfer stations should consider how many other transfer stations and other waste management facilities there are in the neighbourhood and how large such facilities are. There are questions concerning the equitable distribution of the inconveniences and risks associated with waste management facilities as well as questions of practicality.

•It is important that the site selection is made from the broadest possible perspective, i.e., taking into account the concerns and criteria listed here.

Buffer Zone and Zoning:

• Industrial lands, industrial/commercial mix areas and very poor agricultural lands are preferred

• If the transfer station is located in a residential area, a buffer zone of at least two blocks is needed around the facility. Most complaints about existing transfer stations are made within this distance.

• Transfer stations should not operate 24 hours per day in residential areas, i.e., If it is necessary to operate a transfer station 24 hours per day, then the facility must be located in a non- residential area.

• A study should be undertaken to investigate the limitations of different types of transfer station sites. For example, in a heavily industrial area, a transfer station could receive more heavy vehicles for up to 24 hours per day, whereas in a residential/commercial area. such operating conditions would be disruptive to the community.

OTHER CONSIDERATIONS:

• New transfer station facilities should consider the possibility of siting discrete material recovery, sorting and composting facilities at the same location. Clustering these facilities could take advantage of:

- leachate treatment on site
- accessibility of facility for transportation of materials
- minimizing the number of different sites for these
- landspace may be saved
- exchange of materials between facilities
- better buffer zones could be established

• It is essential that the siting of new transfer stations takes into account the problems experienced in the past. Files on complaints to existing transfer stations should be investigated to ensure all potential problems have been addressed. It is easier and less costly to include mitigative measures in the early planning /construction phases than to retrofit the facility after the neighbourhood starts making complaints.

APPENDIX B

The Municipality of
Metropolitan Toronto

Metropolitan Works Department
Phoenix House, 9th Floor
439 University Avenue
Toronto, Ontario, Canada M5G 1Y8
Telephone: (416) 392-8256 Fax: (416) 392-3817
Address all correspondence to the Commissioner
R.G. Ferguson, P. Eng., *Commissioner of Works*

Refer to: **W.G. Crowther** *File no:* **1600.32** *Date:* **June 29, 1990**

Dear Sir/Madame:

This letter is to inform your municipality, and others in Ontario, that Metropolitan Toronto is inviting municipalities and landowners throughout Ontario to nominate potential landfill sites for consideration under Metro's Solid Waste Environmental Assessment Plan (SWEAP).

The 3R's will Play a Major Role in Metro's Plan

Metropolitan Toronto is undertaking a solid waste management master planning process to find an appropriate long-term solution for the management of its municipal, commercial and non hazardous solid industrial waste. Metro is considering alternative waste management methods such as reduction, re-use, recycling, composting, incineration and landfill. Priority is being given to the 3R's of reduction, re-use and recycling. In recognition of the fact that not all of our waste can be reduced, re-used or recycled in the short term, it has been determined that one component of this management plan must be a landfill facility.

Metro is Cooperating with SWISC

Metropolitan Toronto is also a member of the Greater Toronto Area (GTA) Solid Waste Interim Steering Committee (SWISC) which is also endeavouring to develop a solid waste management system for the Greater Toronto Area which includes the Regional Municipalities of Durham, Halton, Peel and York as well as Metropolitan Toronto. SWISC is proceeding in parallel with Metropolitan Toronto's planning process. In October, 1989, SWISC issued a "Request for Expressions of Interest" as part of a public tendering process for developing this system or components thereof. SWISC will issue a request for proposals for disposal facilities later this year.

Among SWISC's fundamental principles is to locate facilities, if possible, in receptive communities and to maximize industrial development opportunities for these communities.

For information on the SWISC process, please call Mr. Victor Rocine at (416) 941-8373.

The Host Community(s) will Benefit

Metro is also currently pursuing discussion with a number of municipalities which have indicated interest in being part of its waste management system or which have been named in Expressions of Interest to the GTA SWISC.

In the past, municipal solid waste has had a negative image, however, if properly managed it can be a resource for recovery of materials and energy and can be developed with a positive image.

The waste management field is undergoing a period of rapid change and development during which waste will be reduced and processed as a resource.

Metro recognizes that there are potential social impacts associated with landfill facilities and will negotiate financial and infrastructure compensation with a municipality hosting a Metro landfill.

The following financial, development and employment benefits may be of interest to willing municipalities:

- free disposal for the local municipalities;
- free use of the waste processing facility for the local municipalities;
- payment of royalties to the local municipalities;
- improvements to local infrastructure;
- assistance in developing a local 3R's and other programs;
- creation of opportunities for local employment.

Metro's Solid Waste Plan

At present, it is expected that a site, or sites, each with a minimum size of 200 ha (500 acres) will be required by Metropolitan Toronto for a landfill. Depending on the size of the landfill it may be operational for at least 10 years. Other components of Metro's waste management system could be co-sited with the landfill (e.g. materials recovery facility, central composting facility).

Metro is looking first within its own boundaries to find a suitable site for landfill. Under the Environmental Assessment Act, it is necessary to perform a comparative evaluation of candidate sites. Studies, to date, have indicated that the number of potentially suitable sites in Metro is limited. Accordingly, the site search provides an opportunity for willing municipalities and/or landowners in Ontario to provide submission of interest to host a landfill facility.

Are You Interested?

For the purpose of Metro's landfill site search, a willing host is defined as any municipality or landowner who offers a site for consideration of at least 200 ha (500 acres). It is preferred, although not essential, that the nominated site, if nominated by the landowner, also have the support of the local municipal council, and the level of government responsible for solid waste management and the adjacent owners within 500 m of site boundary.

The site ultimately selected for the landfill must be environmentally and technically acceptable from a land use perspective. The following is an outline of some of the types of information that will be used to assess sites:

Ground Water:	-	type of soil and/or rock
	-	potential for ground water impacts
Biology:	-	presence of environmentally significant areas
Agriculture:	-	soil capability
	-	presence of specialty crops
	-	intensity of farming

Surface Water:	-	presence of flood plains
Land Use:	-	presence of and proximity to built up areas
	-	future land uses
	-	sensitive land uses and community features
Transportation:	-	availability of transportation corridors

Metro will be responsible for assessing the technical suitability of the sites offered for consideration and will undertake all required site investigations at Metro's cost.

The first step after identification of a potential site is to conduct a thorough geological and hydrogeological drilling and monitoring program to determine if the site is suitable and meets all environmental control requirements. If it meets our objectives, we will subject each site to comparative evaluation and submit one or more applications which will be independently evaluated by the Provincial Ministry of the Environment and Hearing Boards under the Environmental Protection Act or Environmental Assessment Act. Only if environmental control design is found satisfactory will approval be obtained and will we proceed with a landfill.

Public Input is Key

A key requirement of a good landfill site selection process is thorough public input. To this end Metro would be prepared to carry out or assist the municipality with a public consultation program. The aim of this program will be to solicit views on various issues associated with the siting of a landfill (e.g. potential impacts, evaluation criteria, compensation).

How to Follow-Up

If your municipality and/or any landowners in your municipality are interested in receiving further information about this opportunity, please contact our Mr. Bill Crowther at (416) 392-8256. An information package detailing the criteria that potential sites must meet, the role the municipality will play in the process, details on compensation and other aspects about the nature of the waste and the facility will be sent to those expressing interest.

If you are interested in discussing a joint solid waste management system with Metropolitan Toronto, we would appreciate a response by September 3, 1990.

Sincerely,

R.G. Ferguson
Commissioner of Works

WGC/ag/swm - letter.vr

The Globe and Mail, Monday, July 16, 1990

THE MUNICIPALITY OF METROPOLITAN TORONTO · 1953 ·

LAND FOR LANDFILL: OFFERS REQUESTED

Metropolitan Toronto is undertaking a solid waste management master planning process to find a long-term solution for the management of its municipal, commercial and non-hazardous solid industrial waste. One component of this management plan will be a landfill facility.

Metropolitan Toronto's landfill site selection process provides an opportunity for willing landowners in Ontario to provide submissions of interest to offer land for sale for this landfill facility.

If you own land and are interested in making it available for purchase by Metro for this facility, the following points should be considered:

- Sites must be a minimum of 200 hectares (500 acres).
- Sites with willing host municipalities are preferred.
- Offers of Land for Metro's landfill must be received by September 3, 1990.
- The offered sites will be evaluated against a set of evaluation criteria. For this purpose Metro will conduct investigations at Metro's cost to determine the suitability of the offered sites.

Metropolitan Toronto is simultaneously seeking submissions of interest from Municipalities to host this landfill facility and is offering the following benefits to Municpalities:

- Metro is prepared to offer the local municipality compensation such as free waste management, assistance in developing local 3Rs programs, royalties, infrastructure improvements, etc., and to consider other forms of compensation proposed by the municipality
- Metro will carry out or assist the municipality with a public consultation program.

Any site, for which an application is eventually made, will be subject to geological and hydrogeological investigations, and will require approval under all applicable Provincial environmental and other legislation, including the Environmental Protection Act and the Environmental Assessment Act.

If you would like further information and/or would like to express your interest in offering land for this landfill facility, please contact Mr. R. G. Ferguson, Commissioner of Works, attention of Mr. Bill Crowther, Assistant Director — Planning, Solid Waste Management Division, at the following address:

Metropolitan Toronto Works Department
439 University Avenue
Toronto, Ontario M5G 1Y8
Telephone: (416) 392-8256
Fax: (416) 392-4501

Please include any information available with respect to the site location, site size, access, geology, ground and surface water conditions, land use, agricultural capability, etc., which will assist in evaluating the site.

Alan Tonks, M.A. M.Ed.
Chairman
Metropolitan Toronto Council

R. G. Ferguson, P.Eng.
Commissioner of Works

APPENDIX C

MASTER FACTOR LIST		
DISCIPLINES/FACTORS	**DEFINITION**	**RATIONALE**
Air Quality		
• potential for contamination of air quality	• This factor addresses change in air quality associated with landfill operation.	• Addresses air and land components of the environment required by EA Act.
Ground Water		
• potential for contamination of ground water	• This factor addresses the potential for contamination of ground water due to the migration of contaminants during operations and beyond the operating life of the landfill.	• Addresses water and land component of the environment required by EA Act.
Surface Water		
• potential for contamination of surface water and downstream flooding/ erosion/sedimentation	• This factor addresses the potential for contamination of surface water bodies due to discharges or flooding by adjacent surface water bodies that may occur during operating conditions and beyond the operating life of the landfill. Discharges would normally be treated leachate, leachate spills or surface runoff. The potential for downstream flooding/ erosion/sedimentation due to uncontrolled discharge from the site are also addressed because occurrences could cause risk to property and human health. The presence and type of surface water features on-site and in proximity to the site are considered in the evaluation.	• Addresses water and land component of the environment required by EA Act.
Transportation		
• personal injury due to accidents or spills involving facility related vehicles along access routes. • ease of access and potential for traffic disruption	• This factor addresses the potential for traffic accidents that may cause personal injury or death. • This factor addresses the potential for traffic disruption and the ease of access to the potential site.	• Addresses human elements of the environment as defined by EA Act • Addresses human component of the environment as influencing individuals on a community as required by EA Act.

MASTER FACTOR LIST		
DISCIPLINES/FACTORS	**DEFINITION**	**RATIONALE**
Natural Environment and Resources		
• displacement of natural features	• Addresses the extent of displacement of natural features due to facility siting. Displacement is based primarily on land area required for the landfill and buffer zone. Includes classified wetlands, aquatic and waterfowl habitats and interpretation of forest quality/significance.	• Addresses plant and animal life components of environment required by EA Act. • The Fisheries Act provides that no person shall carry out any work that results in harmful alteration, disruption or destruction of fish habitat. Guidelines for Wetlands Management in Ontario and the (proposed) Wetlands Policy Statement provide that all agencies should have regard for the implications of their actions on wetlands. In an overview of Canada's environment, the federal government has stated that the greatest stress on wildlife today is loss of habitat. Under Ontario's Trees Act, councils may pass by-laws restricting and regulating the destruction of trees.
• potential disruption of natural features	• Addresses the extent of disruption of natural features due to facility siting. May be due to effects such as noise, odour, dust, proximity of development, air emissions, or changes in ground water and surface water flows.	• Addresses plant and animal life components of environment required by EA Act.

MASTER FACTOR LIST		
DISCIPLINES/FACTORS	**DEFINITION**	**RATIONALE**
• displacement of agricultural resources	• Addresses the extent of displacement/disruption due to facility siting.	• Addresses land and human component of the environment and social and cultural conditions influencing individuals or a community as required by the EA Act. • Ontario's Foodland Guidelines and the (proposed) Foodland Preservation Policy Statement state that where prime agricultural land has been identified, the use of that land for productive agricultural purposes be given priority in evaluating alternative land uses. Specialty crop land be accorded highest priority, followed by Class 1, 2, 3 and 4 soils in descending order. Non-agricultural development be directed to urban areas, or onto marginal land.
• displacement of mineral aggregate resources	• Addresses extent of displacement of aggregate lands due to facility siting.	• Addresses economic conditions influencing individuals or a community as required by the EA Act. The Ontario Mineral Aggregate Policy Statement provides for maintenance of mineral aggregate supplies.
• displacement of timber agreement resources on site	• Addresses extent of displacement of timber agreement resources due to facility siting.	• Addresses economic conditions influencing individuals or a community as required by the EA Act. • The Ministry of Natural Resources has stated that the investment in timber agreement areas makes them a priority for protection.
Social/Cultural Environment		
• displacement of residents	• This factor addresses extent of displacement of existing residents due to landfill siting.	• Addresses human component of the environment and social and cultural conditions influencing individuals or a community as required by EA Act.

MASTER FACTOR LIST		
DISCIPLINES/FACTORS	**DEFINITION**	**RATIONALE**
• potential disruption to residents in site vicinity	• The day-to-day activities of residents nearby the landfill may be disrupted by effects such as noise, odour, dust, visual effects and traffic. It considers the number of residences and characteristics of their location.	• Addresses human component of the environment and social and cultural conditions influencing individuals or a community as required by EA Act.
• potential displacement of community/recreation features	• Addresses extent of displacement of existing community/recreation features due to landfill siting.	• Addresses human component of the environment and social and cultural conditions influencing individuals or a community as required by EA Act.
• potential disruption to community/recreation features in site vicinity	• Community features nearby the landfill may be disrupted by effects such as noise, odour, dust, visual effects and traffic. It considers the number and characteristics of the features.	• Addresses human component of the environment and social and cultural conditions influencing individuals or a community as required by EA Act.
• potential disruption to residents, businesses and community/recreation features along local access routes	• Addresses the extent of disruption effects to residences, community/recreation features and businesses along local access routes. It was assumed that disruption effects would be greater along local roads since regional roads/highways are designed for a higher capacity of traffic volume.	
• potential effects on school bus routes	• Addresses conflict in the existing school bus routes.	• Addresses human component of the environment and social and cultural conditions influencing individuals or a community as required by EA Act.
• displacement of archaeological resources	• This addresses the potential displacement of archaeological resources due to facility siting.	• Addresses cultural conditions influencing an individual or community as required by EA Act.
• displacement of heritage features	• This factor addresses the displacement of heritage features due to facility siting.	• Addresses cultural conditions influencing an individual or community as required by EA Act.

MASTER FACTOR LIST		
DISCIPLINES/FACTORS	**DEFINITION**	**RATIONALE**
• disruption of heritage features	• This factor addresses the extent of disruption affects to heritage features from such effects as: noise, odour, dust and traffic.	• Addresses cultural conditions influencing an individual or community as required by EA Act.
Land Use		
• compatibility with surrounding future land use	• This factor addresses the extent to which the facility is compatible with future land uses in the study area.	
• compatibility with surrounding existing land uses	• This factor addresses the compatibility of the proposed facility with existing land uses including residential, natural environment, agriculture, commercial, industrial and institutional.	• Addresses economic, land and human components of the environment and social and cultural conditions influencing individuals or a community as required by the EA Act.
Economic		
• benefits of landfill	• Addresses benefits of landfill to host area of the facility.	• Addresses economic component of the environment as defined in the EA Act. • Addresses social equity issue.
Cost		
• transportation haulage cost	• Addresses distance of site from the waste generation area and access route characteristics.	• Addresses economic and land component of the environment defined in the EA Act.
• site operating cost	• This factor group addresses the yearly cost to operate the facilities.	• Addresses economic component of the environment defined in the EA Act.
• site capital cost	• This factor group addresses the capital costs for facility infrastructure.	• Addresses economic component of the environment defined in the EA Act.
Service Potential		
• reliability	• Addresses the extent to which engineered devices will be required, the reliability of service, and the opportunity to maintain the devices.	

MASTER FACTOR LIST		
DISCIPLINES/FACTORS	**DEFINITION**	**RATIONALE**
• flexibility	• Addresses the flexibility of the facility to serve variable waste quantities and characteristics.	
• performance	• This factor addresses the ability of the facility to operate at or above expected/required standards.	
• operations	• Addresses ease or difficulty of development and operations for the landfill including access.	